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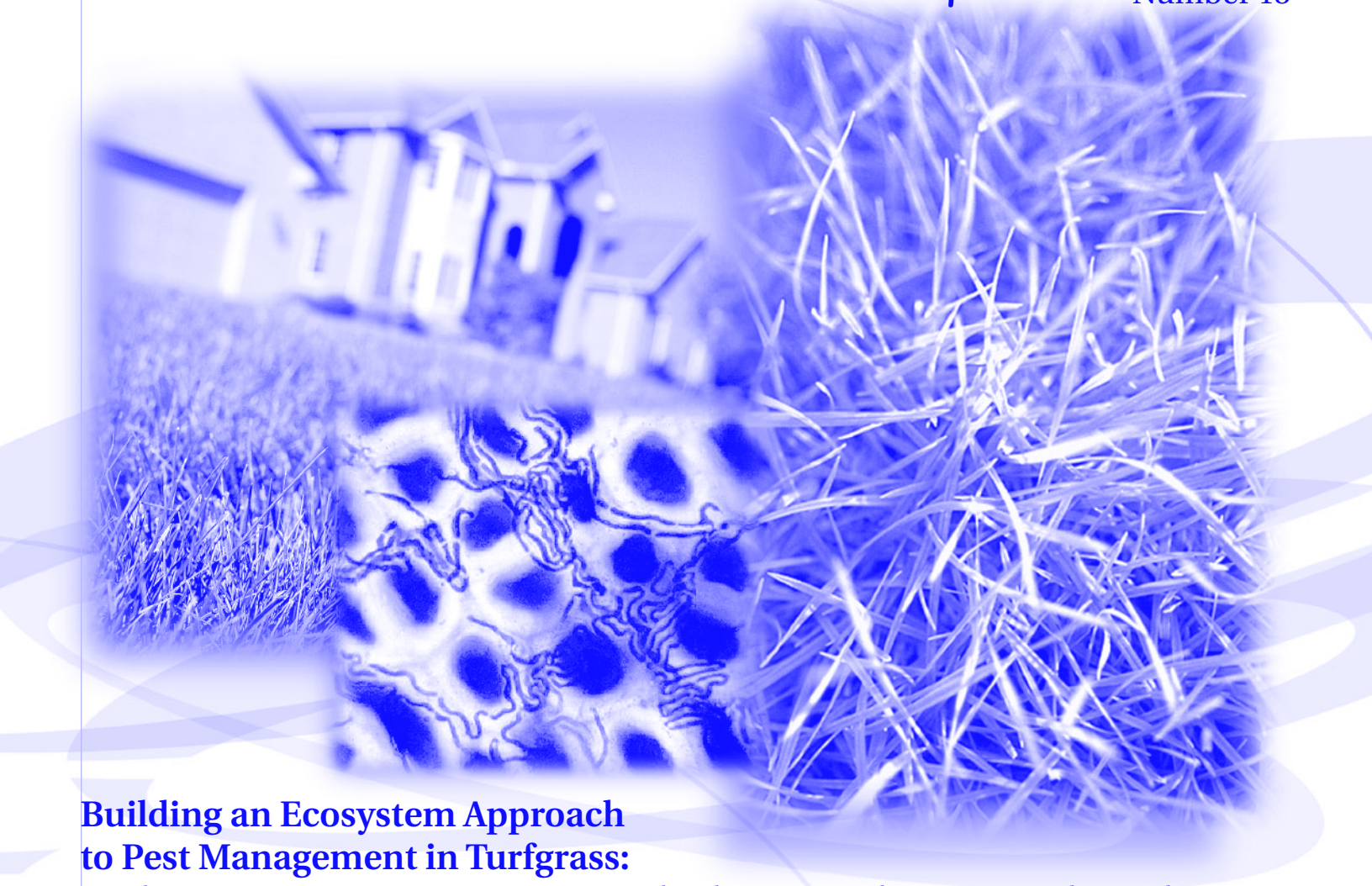

Building an Ecosystem Approach to Pest Management in Turfgrass: Evaluating Interactions Among Endophytes, Herbivores, and Weeds

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Turfgrass management is a multi-billion dollar industry in the United States, and Ohioans spend in excess of $1 billion on maintaining lawns throughout the state. Turfgrass management without chemicals is increasingly important to homeowners as well as those who care for golf courses, parks, and other public areas. The chemicals used to manage insect pests and weeds are expensive and problematic to the environment. This team looked at developing a biologically based approach to turfgrass pest management that relies on the combined use of natural resistance caused by endophytes (a fungus that lives inside a host plant) and insect parasites (entomopathogenic nematodes) to manage insect pests and weeds.

The overall hypothesis is that fungal endophytes will reduce damage by insect and nematode pests and increase their susceptibility to entomopathogenic nematodes, resulting in enhanced grass health and reduced weed invasion and development. If accomplished, this will reduce the amount of chemicals used in the management of turfgrass while increasing environmental quality and the safety of turfgrass areas.

OBJECTIVES

Identify alternatives to help reduce chemicals used to manage insect and weed pests in turfgrass.

CHALLENGE

Finding and identifying alternative methods to manage insect and weed pest populations in turfgrass while reducing the reliance on chemicals, thus reducing expenses in maintaining aesthetically pleasing turfgrass. Reducing chemical use will also increase the safety of turfgrass areas as well as overall environmental quality.

ACHIEVEMENTS

Test plots were established for endophytic and nonendophytic perennial ryegrass and tall fescue. Results demonstrated that the best time to establish endophytic grasses is in the fall, and endophytic grasses have no negative effect on below-ground invertebrates. Additional data show that mowing height and frequency significantly influence the insect resistance of endophytic grasses through their impact on alkaloid production. The below-ground insect pests, such as white grubs, become more susceptible to entomopathogenic nematodes when feeding on roots of endophytic grasses. But the above-ground insect pests, black cutworm and fall armyworm, become less susceptible to entomopathogenic nematodes when feeding on endophytic grasses as compared with the nonendophytic grasses. These results underscore the importance of multi-trophic interactions in turfgrass pest management.

THE FUTURE

The team has received $170,000 in funding from USDA to continue gathering data on the established test plots and to conduct further experiments to determine the optimum combination of grasses and nematodes for effective control of weed and insect pests.

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